

BACHARACH (J-W) CONTINUOUS GAS MONITOR

DESCRIPTION AND USE

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1. GENERAL

1.01 This section describes the Bacharach Instrument Company (J-W) Continuous Gas Monitor used in testing for the presence of natural gas, gasoline vapors, methane, and other similar combustible gases.

2. DESCRIPTION

2.01 The J-W Gas Monitor, shown in Fig. 1, is a dual filament gas detector designed for continuously testing a manhole atmosphere. Continuous sampling is performed by applying the principles of diffusion and convection with the detector units operating directly in the areas under test.

2.02 The unit is equipped with fail-safe features to automatically warn the operator when there is a power disconnect, low voltage, detection circuit failure (opens, grounds, shorts, crosses), or

a gas concentration of 10 percent or higher of the lower explosive limit (LEL).

2.03 The electrical circuit is a balanced Wheatstone bridge. A catalytically active resistance element is connected as one arm of the bridge and heated by an electric current. A sample of the atmosphere to be tested is exposed to the element and any combustible gas or vapor in the sample is burned when it comes in contact with the catalytic surface. The heat released by this reaction raises the temperature of the element and thereby increases its electrical resistance. The change in resistance unbalances the bridge, with the resulting current tripping the alarm device.

2.04 A second resistance element, electrically identical to the first but catalytically inactive, is connected in the same sensing head as an adjacent leg of the Wheatstone bridge. This second element serves to compensate for variations in ambient pressure, temperature, voltage, and for changes in resistance due to element aging.

2.05 A solid state amplifier senses the bridge unbalance and actuates an alarm circuit within a range of 10 to 90 percent LEL. This amplifier is normally set to alarm at 10 percent LEL; however, in concurrence with local safety practices a higher level LEL alarm point may be used.

2.06 The J-W Continuous Gas Monitor consists of two basic assemblies: the cabinet assembly and the detector assemblies.

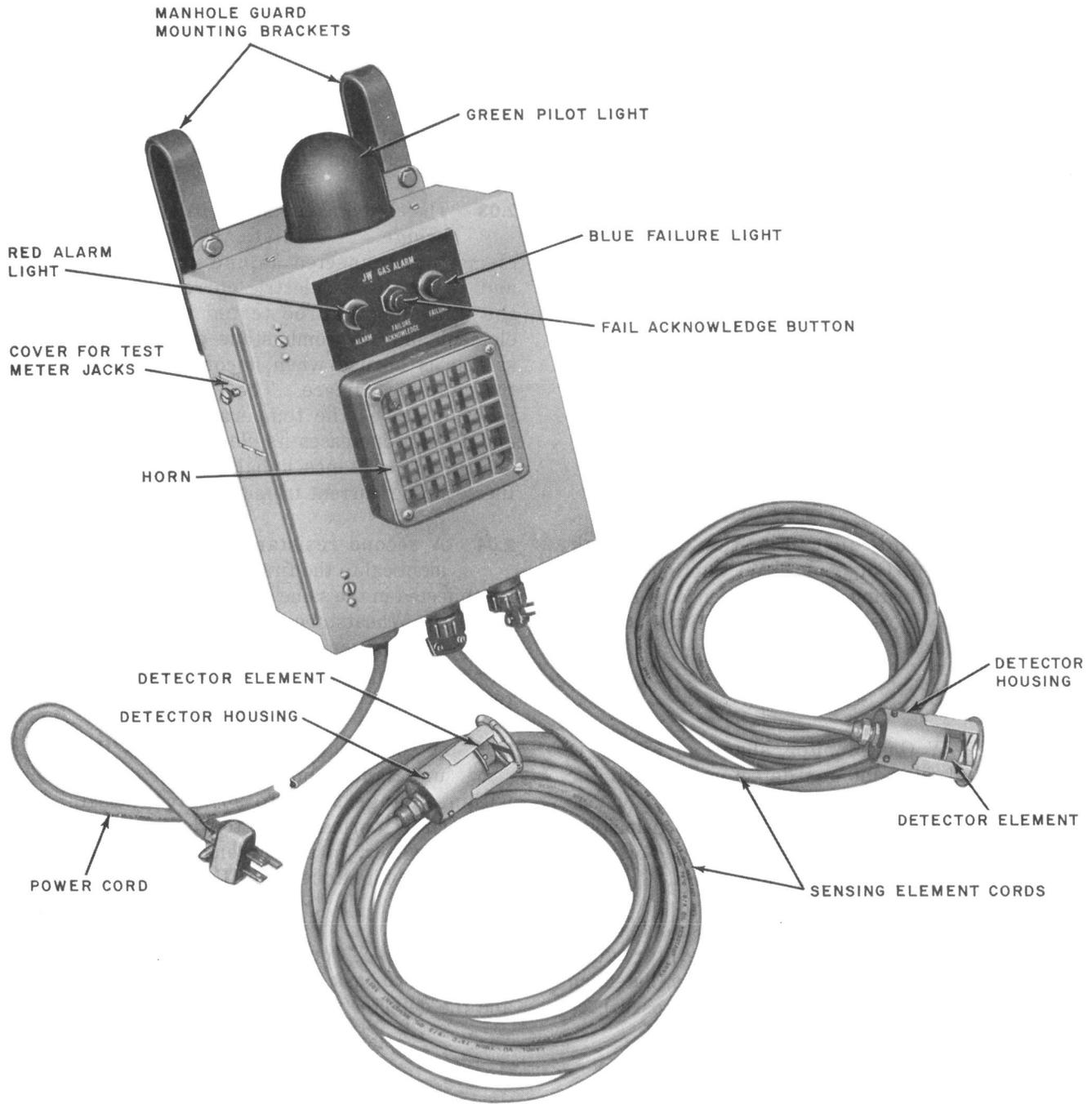


Fig. 1—Bacharach (JW) Continuous Gas Monitor

2.07 The cabinet assembly consists of the following items:

- (1) **A green pilot light** is located on the top of the control cabinet. The pilot light indicates that power is being applied to the monitor and that the detector circuit is energized.
- (2) **A blue failure light** comes on when the detector circuit is not fully operational. This condition could be caused by voltage regulator failure, failure in the detector amplifier, sensor failure, or shorts, crosses, grounds, or opens in the detector circuit.
- (3) **A red alarm light** comes on when the gas concentrations at either sensor or where the cumulative total of gas concentrations at both sensors exceeds the 10 percent LEL alarm setting.
- (4) **A 12-volt horn** sounds in the event of a circuit alarm or gas alarm.
- (5) **A fail acknowledge** momentary contact pushbutton switch silences the horn in the event of a circuit failure or power disconnect. This switch will also silence the horn during gas alarm conditions only after the instrument has been unplugged.
- (6) **A zero adjuster**, consisting of a potentiometer located on the left side of the instrument, is used in connection with the test meter jacks to zero the instrument. Zero adjuster and jacks are protected by a gasketed door.
- (7) **Two test meter jacks** allow zeroing the instrument with an external voltmeter.
- (8) **The two detector connectors** are numbered 1 and 2 and are located at the bottom of the control cabinet to provide connections for the three wires of each detector.

Caution: *Detectors 1 and 2 must not be reversed as it would unbalance the bridge.*

- (9) **A printed circuit board** contains the electrical circuitry, relays, and adjustments for the instrument.
- (10) **A step-down transformer and rectifier** converts the input power to a usable dc

voltage within the printed circuit board and provides a charging current for the battery.

- (11) **Nickel cadmium type rechargeable batteries** power the alarm horn up to 30 minutes in the event of a power or circuit failure or gas alarm condition.
- (12) **A fuse** protects internal electrical circuits in case of a short circuit.

2.08 The detector or sensing head assemblies are intended for use at the duct entrances in the manhole where gas is likely to be detected. The circuit is designed to accept two detectors so sampling is done from two points with a common alarm signal. The indicator and alarm circuits sense the cumulative total of the gas concentration at both detector heads, or will alarm from only one detector head if the gas concentration exceeds the LEL alarm setting. The detector assembly consists of the following items.

- (1) **Each detector housing** consists of miniature junction boxes and wire protection cages. Each junction box is connected to the control cabinet by a three-wire cable.
- (2) **Each detector or sensing element** is housed in a porous bronze cap which acts as a flash-back screen to prevent ignition of a combustible atmosphere by the glowing element and at the same time permit free circulation of the surrounding atmosphere at both the active and reference elements. Each detector element is mounted on a miniature seven-pin plug which plugs directly into the detector housings.

3. TESTING AND SETTING UP GAS MONITOR

3.01 Each day prior to placing the gas monitor in operation, the following procedures must be performed in a gas free atmosphere away from the manhole or cable vault that is to be tested and by personnel familiar with this routine.

3.02 Orient both detector head assemblies in the same position: hanging down or on their sides. Plug the monitor into a 115-volt 60 Hz outlet. The green pilot light and the red gas alarm light should come on and the alarm horn should sound. If the horn sounds but the green pilot light does not come on, replace the pilot light. If the green pilot light comes on but the horn does

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not sound, check for 12 volts at the battery terminals, and that the horn contacts are closed. If after a brief warm-up period (5 to 10 seconds, slightly longer in cold weather) the horn will not silence, refer to Table A. If the horn will not silence, or the alarm lights remain on, return for maintenance in accordance with local routine.

3.03 Gas Test: Using a B or C gas test kit, momentarily introduce gas at each detector, one at a time. The red gas alarm light and horn should come on, and in turn go off, as the gas has had chance to dissipate.

Caution: *The operation of the gas monitor should not be checked by sampling the vapors from a gasoline container or with acetylene or propane gas. The lead content of gasoline vapors may deposit on the detector filaments affecting the sensitivity of the instrument. Acetylene and propane gases could cause damaging flashback.*

3.04 Detector Failure Test: In turn, unplug each of the detectors at the control box. The blue failure light and horn should come on. Press the failure acknowledge switch to silence the horn; the failure light should stay on. Replace the detector cords; failure light should go out.

Caution: *Care should be exercised not to interchange detector positions (connectors*

are numbered) as this will unbalance the bridge.

3.05 Power Failure Test: Unplug the instrument, the green pilot light will go out. The horn should come on. Press failure acknowledge switch; the horn should silence.

3.06 The gas monitor is ready to be placed in operation. No adjustments or further tests should be necessary in the field.

4. OPERATION

4.01 Before entering a manhole, make sure proper ventilation is supplied and all standard precautions described in Section 620-140-501 are followed. Make preliminary gas tests before entering a manhole by lowering the sensing heads into the manhole, making sure that the sensing heads do not touch water. If gas is detected when preliminary tests are made, proceed as described in Section 620-140-501.

4.02 Hang the gas monitor on the manhole guard as shown in Fig. 2 and 3 by use of the hooks provided on the rear of the control cabinet. A location should be selected so that power is accessible and detectors will reach the desired sampling area.

**TABLE A
GAS MONITOR TURN-ON PERIOD**

INDICATION				CAUSE
PILOT LIGHT	HORN	RED GAS ALARM LIGHT	BLUE CIRCUIT ALARM LIGHT	
ON	ON	ON	OFF	Normal warm-up (5 to 10 seconds)
OFF	OFF	OFF	ON	Detector or internal failure
OFF	OFF	OFF	OFF	Power or fuse failure

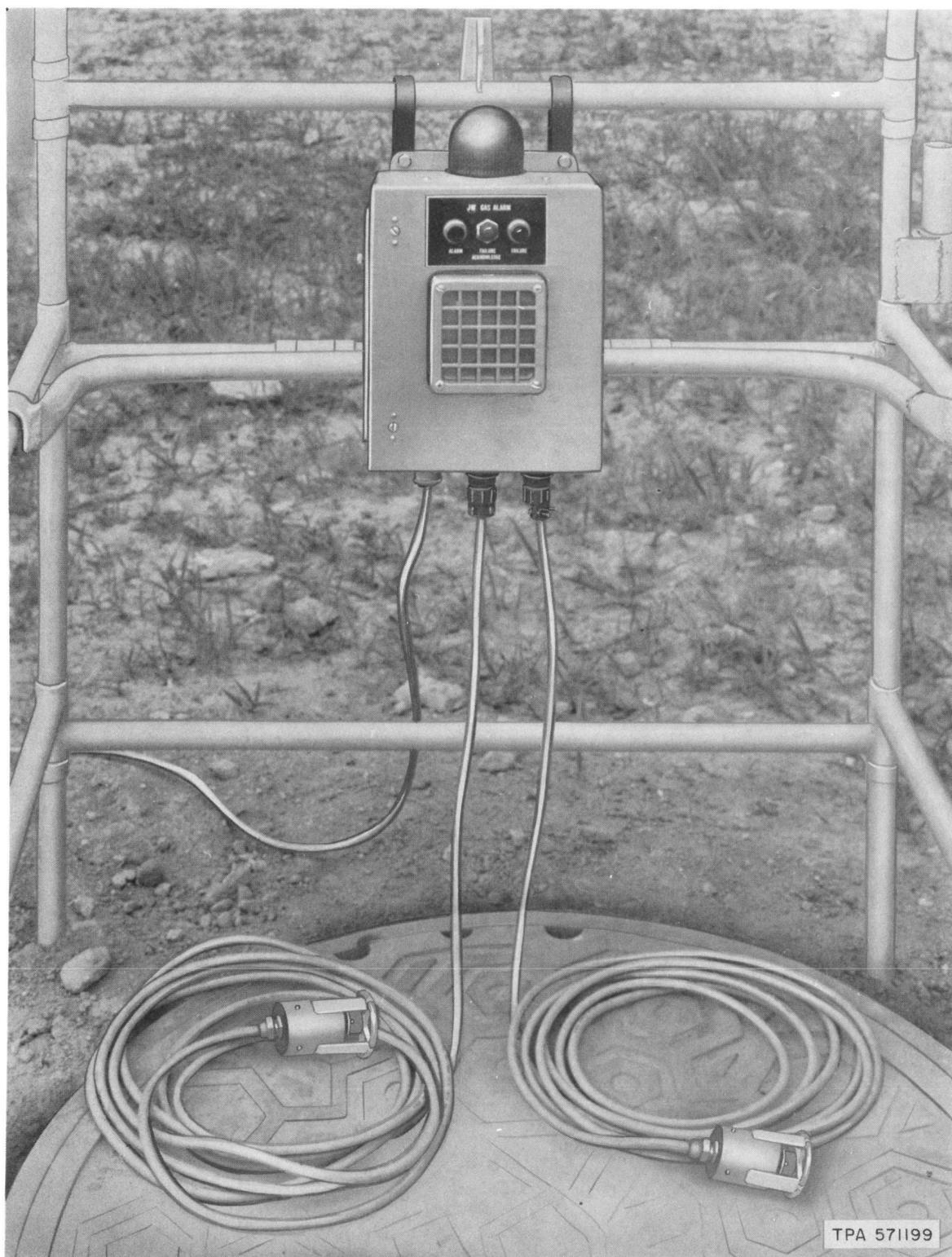


Fig. 2—Gas Monitor Attached to Inside of Manhole Guard



Fig. 3—Gas Monitor Attached to Outside of Manhole Guard

4.03 The detector assemblies require no special installation. Place the detectors where they will be protected from water, mud, or anything which might clog the porous bronze cap. Do not place the detectors near extremely hot objects or where they might be subjected to excessive vibration. The detectors sample from the immediate surrounding atmosphere, so they should be placed at the duct entrances to be tested.

4.04 Plug the gas monitor power cord into a 115-volt 60-Hz outlet. Refer to 3.02 for warm-up condition.

4.05 When the gas monitor is in operation, any gas alarm, circuit, or detector failure will

sound the horn and cause the proper alarm lights to come on as described in Table B.

5. MAINTENANCE

5.01 All continuous gas monitors should be returned periodically for routine checking. All maintenance operations, other than those outlined in Part 3, should be performed by qualified personnel assigned the responsibility for such maintenance.

5.02 A maintenance chart, shown in Fig. 4, indicating the dates when various maintenance operations have been performed is attached to the rear of the gas monitor.

TABLE B
GAS MONITOR IN OPERATION

INDICATION				CAUSE
PILOT LIGHT	HORN	RED GAS ALARM LIGHT	BLUE CIRCUIT ALARM LIGHT	
ON	OFF	OFF	OFF	Normal operation
ON	ON	ON	OFF	Gas alarm
OFF	ON	OFF	ON	Detector or circuit failure
OFF	ON	OFF	OFF	Power or fuse failure

